

SPECIFICATION

FIBRE SIZING AGENT

5 TECHNICAL FIELD

[0001]

The present invention relates to a textile sizing agent comprising polyvinyl alcohol, starch and wax.

10 BACKGROUND ART

[0002]

A sizing agent for reinforcing warps in a fabric has been selected from polyvinyl alcohol (hereinafter, sometimes abbreviated as "PVA"), starches, carboxymethylcellulose, water-soluble acrylic sizing agents and so on. Among
15 these, starch is the oldest naturally-occurring water-soluble polymer used as a warp sizing agent, and is now widely used mainly as a warp sizing agent for a spun yarn because of its low cost. It, however, gives a weak size film, and therefore, in case of a sizing agent with a high starch ratio, the amount of the agent attached to a thread must be increased.

20 [0003]

In contrast, a PVA is resistant to decay as a water-soluble sizing agent so that it can be stored for a long time, and a film formed is very strong. It has been, therefore, used as a main component of a sizing agent instead of starch. However, if a blending ratio of PVA in a sizing agent is too high, higher
25 strength of a size film as described above may cause yarn breakage, yarn

strength loss or fluffing during so-called dividing, that is, a process of applying a size solution to a sheet for sizing, drying it and then dividing the sheet of sized yarn bundle into individual sized yarns.

[0004]

5 For solving the problem, blending starch and PVA for improving defects of these have been widely attempted, and such a blend has been widely used as a warp sizing agent for a spun yarn, mainly cotton 100 % yarn. As such a textile sizing agent, WO 92/04497 has suggested a textile sizing agent containing polyvinyl alcohol, starch and water-soluble cellulose compound in a
10 particular proportion and meeting a particular solution viscosity condition, and has described that it exhibits improved size solution stability, dividing performance and weaving performance. Furthermore, JP 1989-111073A has suggested a textile sizing agent consisting of two PVAs different in a viscosity-average polymerization degree and a saponification degree and starch,
15 and has described that the sizing agent exhibits improved weaving performance and that a film formed from the sizing agent exhibits surface smoothness.

[0005]

 These textile sizing agents are satisfactory in weaving performance, but are practically unsatisfactory in reduction of size peeling during dividing and
20 improvement in fabric texture and desizing performance. There is, therefore, needed a textile sizing agent whereby compared with a conventional one, size peeling during dividing can be reduced and fabric texture and desizing performance are improved. Here, "size peeling" means that a textile sizing agent is peeled off from a yarn during dividing where a sheet of sized yarn
25 bundle is divided into individual sized yarns, and a smaller amount of the sizing

agent peeled is better. Furthermore, "fabric texture" means texture of a fabric to which a textile sizing agent before desizing.

PRIOR ART REFERENCES

5 Patent References

[0006]

Patent Reference No. 1: WO 92/04497

Patent Reference No. 2: JP 1989-111073 A

10 SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0007]

In the light of the above situation, an objective of the present invention is to provide a textile sizing agent whereby size peeling during dividing
is reduced and weaving performance, fabric texture and desizing performance
15 are improved. Another objective is to provide a warp sized using the textile sizing agent, in which size peeling during dividing is reduced and weaving performance and desizing performance are improved. Another objective is to provide a process for producing a fabric, comprising weaving the warps and
20 wefts using a loom.

MEANS FOR SOLVING THE PROBLEMS

[0008]

As a result of extensive investigation, we have found that the above
25 problems can be solved by providing a textile sizing agent comprising polyvinyl

alcohol, starch and wax in which an average particle size of the wax in an aqueous dispersion at 70 °C is within a particular range; a warp sized using the textile sizing agent; and a process for producing a fabric comprising weaving the warps and wefts using a loom, and have achieved this invention.

5 [0009]

Specifically, the present invention relates the followings:

[1] A textile sizing agent comprising polyvinyl alcohol, starch and wax, wherein

the polyvinyl alcohol has a viscosity-average polymerization degree
10 of 200 to 5000 and a saponification degree of 70 to 99.5 mol%;

a mass ratio of the polyvinyl alcohol to the starch is 90/10 to 1/99;

a content of the wax is 0.5 to 20 % by mass based on the total amount of solid; and

in an aqueous dispersion at 70 °C prepared from the textile sizing
15 agent with a solid concentration of 10 % by mass, an average particle size (X) of the wax is 0.1 to 50 μm.

[2] The textile sizing agent as described in [1], wherein for the aqueous dispersion with a solid concentration of 10 % by mass, an average particle size (X) of the wax at 70 °C and an average particle size (Y) of the wax
20 at 20 °C meet the following formula (I).

$$0.05 \leq X/Y \leq 0.8 \quad (I)$$

[3] The textile sizing agent as described in [1] or [2], wherein the wax comprises a petroleum wax.

[4] The textile sizing agent as described in any of [1] to [3], wherein
25 the starch is modified starch.

[5] A warp sized using the textile sizing agent as described in any of [1] to [4].

[6] A process for producing a fabric, comprising weaving the warps as described in [5] and wefts using a loom.

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EFFECTS OF THE INVENTION

[0010]

As described above, a textile sizing agent of the present invention can reduce size peeling during dividing and is excellent in weaving performance, fabric texture and desizing performance. A warp sized using such a textile
10 sizing agent reduces size peeling during dividing and is excellent in weaving performance and desizing performance. Furthermore, a process for producing a fabric comprising weaving such warps and wefts using a loom can readily provide a fabric with good texture.

15

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

FIG. 1 shows a photomicrogram of an aqueous dispersion of a textile sizing agent containing PVA, starch and wax with a solid concentration of 10 %
20 by mass at 20 °C in Example 1.

FIG. 2 shows a photomicrogram of an aqueous dispersion of a textile sizing agent containing PVA, starch and wax with a solid concentration of 10 % by mass at 70 °C in Example 1.

25 MODES FOR CARRYING OUT THE INVENTION

[0012]

There will be further detailed the present invention. A textile sizing agent of the present invention is characterized by containing PVA, starch and wax in a particular proportion, wherein an average particle size of the wax in an aqueous dispersion of the textile sizing agent with a particular concentration at a particular temperature is 0.1 to 50 μm . Although technical reasons are not clearly understood, particularly an average particle size of the wax in an aqueous dispersion of a textile sizing agent within the above range allows for reducing size peeling during dividing and for providing a textile sizing agent excellent in weaving performance, fabric texture and desizing performance.

[0013]

A viscosity-average polymerization degree of PVA used in the present invention is measured in accordance with JIS K6726:1994. Specifically, the PVA is re-saponified to a saponification degree of 99.5 mol% or more and then purified, followed by measuring a limiting viscosity $[\eta]$ (liter/g) in water at 30 $^{\circ}\text{C}$, from which the viscosity-average polymerization degree can be determined by the following formula.

$$P = ([\eta] \times 10000 / 8.29)^{(1/0.62)}$$

[0014]

A viscosity-average polymerization degree of the above PVA is 200 to 5000, preferably 500 to 4000, more preferably 1000 to 3500. If a viscosity-average polymerization degree of PVA is less than 200, size peeling during dividing is increased, and weaving performance becomes unsatisfactory. If the viscosity-average polymerization degree is more than 5000, an aqueous solution of the PVA is too viscous, leading to difficulty in handling a textile sizing

agent and deterioration of fabric texture.

[0015]

A saponification degree of the above PVA is measured in accordance with JIS K6726:1994. A saponification degree of the PVA is 70 to 99.5 mol%,
5 preferably 75 to 99 mol%, more preferably 80 to 98.8 mol%. If a saponification degree of the PVA is less than 70 mol%, water solubility of the PVA may be reduced, giving an unfavorable textile sizing agent. If the saponification degree is more than 99.5 mol%, the above PVA cannot be stably produced.

[0016]

10 Although there are no particular restrictions to a process for producing the above PVA, it can be produced by saponifying, by a well-known method, a polyvinyl ester which is prepared by polymerization or copolymerization of a vinyl ester by a known polymerization method such as bulk polymerization, solution polymerization and emulsion polymerization.
15 Examples of a vinyl ester include vinyl formate, vinyl acetate, vinyl propionate and vinyl pivalate. Among these, vinyl acetate is preferable from the industrial point of view.

[0017]

In polymerization of a vinyl ester, it can be copolymerization of the
20 vinyl ester and another monomer without departing from the spirit of the present invention. Examples of another monomer which can be used include α -olefins such as ethylene, propylene, n-butene and isobutylene; acrylic acid and salts thereof; acrylic acid esters; methacrylic acid and salts thereof; methacrylic acid esters; acrylamides; acrylamide derivatives such as N-methylacrylamide,
25 N-ethylacrylamide, N,N-dimethylacrylamide, diacetone acrylamide, acrylamide

propanesulfonic acid and salts thereof, acrylamide propyldimethylamine and salts or quaternary salts thereof, N-methylol acrylamide and derivatives thereof; methacrylamide; methacrylamide derivatives such as N-methylmethacrylamide, N-ethylmethacrylamide, methacrylamide propanesulfonic acid and salts thereof, 5 methacrylamide propyldimethylamine and salts or quaternary salts thereof, N-methylol methacrylamide and derivatives thereof; vinyl ethers such as methyl vinyl ether, ethyl vinyl ether, n-propyl vinyl ether, i-propyl vinyl ether, n-butyl vinyl ether, i-butyl vinyl ether, t-butyl vinyl ether, dodecyl vinyl ether and stearyl vinyl ether; nitriles such as acrylonitrile and methacrylonitrile; halogenated vinyls 10 such as vinyl chloride and vinyl fluoride; halogenated vinylidenes such as vinylidene chloride and vinylidene fluoride; allyl compounds such as allyl acetate and allyl chloride; unsaturated dicarboxylic acids and salts or esters thereof such as maleic acid, itaconic acid and fumaric acid; vinylsilyl compounds such as vinyltrimethoxysilane; and isopropenyl acetate.

15 [0018]

Examples of a starch used in the present invention include raw starches such as corn starch, potato starch, tapioca starch and wheat starch, and modified starches thereof. Examples of a modified starch include 20 pregelatinized (gelatinized) starch, oxidized starch, esterified starch, etherified starch, graft starch, carboxymethylated starch, dialdehyde starch and cationized starch. Among these, a modified starch is preferable in the light of easy pregelatinization and preparation of a size solution.

[0019]

A mass ratio of the PVA to the starch (PVA/starch) is 90/10 to 1/99, 25 preferably 80/20 to 30/70, more preferably 75/25 to 50/50. If a rate of the PVA

to the starch is more than 90 % by mass, weaving performance is unsatisfactory. If a rate of the PVA to the starch is less than 1 % by mass, size peeling during dividing is increased and fabric texture is deteriorated.

[0020]

5 Examples of a wax used in the present invention include petroleum waxes such as paraffinic wax; synthetic waxes such as polyol fatty acid esters and polyethylene oxide; animal and plant waxes such as carnauba wax, candelilla wax, beeswax and rice wax; and mineral waxes. These waxes can be used alone or in combination of two or more. A wax, which is oil-soluble, is
10 generally used as an aqueous dispersion prepared by emulsifying using a surfactant such as a nonionic surfactant and an anionic surfactant in the light of dispersibility. Among these, the use of a petroleum wax is preferable because smoothness of a sized yarn is improved.

[0021]

15 A wax content of a textile sizing agent is 0.5 to 20 % by mass, preferably 1 to 15 % by mass, more preferably 2 to 12 % by mass, particularly preferably 3 to 10 % by mass based on the total amount of solid. Here, the total amount of solid is the total amount of dry solid contained in a textile sizing agent. If the wax content is less than 0.5 % by mass, weaving performance
20 and fabric texture are deteriorated. If the wax content is more than 20 % by mass, size peeling during dividing is increased due to peeling of the wax and furthermore, desizing performance is deteriorated.

[0022]

 A textile sizing agent of the present invention has the best
25 characteristic that an average particle size (X) of the wax in an aqueous

dispersion containing the textile sizing agent in a solid concentration of 10 % by mass at 70 °C (FIG. 2) is 0.1 to 50 µm. Although technical reasons are not clearly understood, it has been found that a textile sizing agent in which an average particle size (X) of the wax in an aqueous dispersion at 70 °C is 0.1 to 50 µm can be used to reduce size peeling during dividing and to achieve excellent weaving performance, fabric texture and desizing performance. It would be related to the fact that the wax is finely dispersed in an aqueous dispersion of the textile sizing agent (size solution) at 90 to 95 °C during sizing, resulting in a sized yarn in which the applied wax is more uniformly present in a matrix consisting of polyvinyl alcohol and starch. If an average particle size (X) of the wax in the above aqueous dispersion is less than 0.1 µm, weaving performance is deteriorated. If an average particle size (X) of the wax in the above aqueous dispersion is more than 50 µm, desizing performance is unsatisfactory. An average particle size (X) of the wax in the aqueous dispersion is preferably 0.5 to 40 µm, more preferably 1 to 30 µm, further preferably 1 to 20 µm. In FIG. 2, black dots scattered are wax particles and PVA and starch are dissolved in the aqueous dispersion. Herein, an average particle size (X) [unit: µm] is an average of a long diameter of wax.

[0023]

In the present invention, it is important that an average particle size (X) of a wax in an aqueous dispersion containing a textile sizing agent in a solid concentration of 10 % by mass at 70 °C is within a particular range. Furthermore, in the light of further improvement of the effects of the present invention, it is preferable that in the above aqueous dispersion, an average particle size (X) of wax at 70 °C (FIG. 2) and an average particle size (Y) of wax

at 20 °C (FIG. 1) meet the following formula (I):

$$0.05 \leq X/Y \leq 0.8 \quad (I)$$

Although technical reasons are not clearly understood, in a sizing process conducted at a high temperature of 70 °C or higher as described above, the wax is finely dispersed in the aqueous dispersion of the textile sizing agent (size solution), resulting in a sized yarn in which the applied wax is more uniformly present in a matrix consisting of polyvinyl alcohol and starch, and thus, a sized yarn excellent in weaving performance and fabric texture is provided.

Meanwhile, in a desizing process conducted at a temperature of about 20 to 60 °C, the polyvinyl alcohol and the starch are redissolved and thus easily removed from the fiber surface, but the wax is detached from the fiber surface as a dispersed material, so that the detached wax may reattach to the fiber surface, leading to deterioration in desizing performance. However, probably the detached wax gathers to be aggregates with a larger particle size, which tend to settle out, resulting in inhibition of reattachment to the fiber surface and thus good desizing performance.

[0024]

The above formula (I) is more preferably $0.10 \leq X/Y \leq 0.7$, further preferably $0.15 \leq X/Y \leq 0.6$. Here, it is technically difficult to prepare a textile sizing agent in which X/Y is less than 0.05. Meanwhile, if the X/Y is more than 0.8, aggregation of the wax is inhibited, so that desizing performance may be deteriorated.

[0025]

For example, an average particle size (X) of the wax at 70 °C can be adjusted to 0.1 to 50 μm by, but not limited to, adapting a composition ratio and

blending method of individual components, the type of the wax, a preparation method of the aqueous dispersion and the like.

Specific methods are as described below.

(A) A wax containing a nonionic surfactant is used.

5 (B) A paraffinic wax and an animal wax are used in combination.

(C) In terms of a textile sizing agent containing PVA, starch and wax, when individual components are premixed to prepare a powdery blended sizing agent, PVA, the modified starch and the paraffinic wax were added in this order such that each component was added in multiple portions, and the mixture is
10 blended.

(D) When an aqueous dispersion containing PVA, starch and wax is prepared, the components are added to water while or before stirring.

These methods may be effective alone, but preferably combined for further improved effects.

15 [0026]

There are no particular restrictions to a stirring method in preparing the above aqueous dispersion, but stirring is preferably conducted using a stirring blade in the light of finely dispersing a wax in the aqueous dispersion. In terms of the shape of the stirring blade, preferred are, but not limited to, a
20 pitched paddle blade, a turbine blade and an anchor blade, and among these, a pitched paddle blade is more preferably used. The pitched paddle blade has a pitch angle of preferably 15 ° or more, more preferably 30 ° or more. The number of blades in the pitched paddle blade is preferably, but not limited to, 2 to 6. A revolution in the stirring is preferably 100 to 300 rpm in the light of
25 improving desizing performance.

[0027]

A wax whose melting point is preferably 25 °C to 95 °C, more preferably 35 °C to 85 °C, particularly preferably 40 °C to 80 °C is used for achieving an average particle size (X) of the wax at 70 °C of 0.1 to 50 µm and a
5 ratio to an average particle size (Y) (X/Y) at 20 °C of 0.05 or more and 0.8 or less. By preparing a textile sizing agent at a temperature of the melting point of the wax or higher, shear force is applied to the liquid wax, which allows for dispersion of the wax with a small particle size. Furthermore, when a temperature of the dispersed wax is its melting point or lower, the dispersed
10 wax becomes solid state, resulting in tendency to aggregation and a larger average particle size. If a melting point of the wax is lower than 25 °C, a friction coefficient is increased, leading to tendency to warp breakage during dividing. If a melting point of the wax is higher than 95 °C, the wax tends to precipitate as a foreign matter in the surface of a textile size solution during
15 sizing, leading to uneven sizing.

[0028]

As long as its effects are not deteriorated, a textile sizing agent of the present invention can contain, for example, a water-soluble polymer such as a water-soluble cellulose compound and a water-soluble acrylic sizing agent; a
20 defoamer; an antistatic agent; an antiseptic; and/or a mildew-proofing agent. Examples of a water-soluble cellulose compound include methyl cellulose, ethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose and carboxymethyl cellulose.

[0029]

25 The form of a textile sizing agent of the present invention can be,

but not limited to, a powder or a dispersion liquid. Furthermore, when a textile sizing agent of the present invention further contains other components such as a water-soluble cellulose compound, there are no particular restrictions to a method for adding them; they can be added to a pre-formed powder or
5 separately added to water.

[0030]

There are no particular restrictions to the type of a yarn for which a textile sizing agent of the present invention can be used, and preferred are a single yarn or blended yarn of cotton, polyester, rayon, hemp, nylon, wool, acryl
10 or the like. In preparation of a size solution, the sizing conditions can be appropriately selected depending on a subject warp, and generally for a spun yarn, a size solution of a sizing agent for warp sizing with a relatively high viscosity which is not restrictive is used for good fluff binding. Generally, viscosity at a sizing temperature of 70 to 95 °C is 50 to 200 mPa·s. A solid
15 concentration of the size solution is preferably, but not limited to, 3 to 15 % by mass.

[0031]

There are no particular restrictions to a method for sizing a textile sizing agent of the present invention; for example, simultaneous slasher sizing,
20 sectional warping sizing, tape sizing and cheese sizing.

[0032]

A deposition amount of a sizing agent on a fiber (size pick-up) can be appropriately selected depending on fabric standard, facilities such as a loom and a sizing machine used, or the like, and is generally 5 to 25 % by mass.
25 Generally, for a spun yarn, a sizing agent is used mainly for fluff binding on the

surface of a sized yarn and reinforcement by internal permeation, and therefore, a deposition amount of a sizing agent is determined, taking required performance of a sized yarn into account. Generally, a larger deposition amount of a sizing agent improves abrasion resistance and fluff binding and
5 reduces warp breakage during weaving.

[0033]

A textile sizing agent of the present invention can be used either warps or wefts, and generally, it is preferably used for warps. High tension is applied to warps for ensuring opening on a loom, so that friction with a reed, a
10 heald and a dropper is high. Thus, for enduring the friction, warps must be reinforced. A warp sized using the above textile sizing agent is, therefore, another embodiment of the present invention. In such a warp, size peeling during dividing is reduced and weaving performance is excellent.

[0034]

15 Warps immediately after sizing are dried by a cylinder (surface temperature: 100 to 150 °C). A warp sheet after drying is separated into individual yarns. The individual warps are wound up by a beam for fabric. The warps thus sized warp can be used to produce a fabric as described later.

[0035]

20 A fabric of the present invention is produced by a method comprising weaving the sized warps and wefts using a loom. As with warps, wefts can be sized, but original yarns are generally used as they are, without any particular treatment.

[0036]

25 Examples of a loom include a dry loom such as a rapier loom and an

air jet loom; and a water jet loom. Among these, an air jet loom is preferable. In weaving, for example, the above sized warps are subjected to warping (drawing), that is, individually drawn through a heddle and a reed for preparing warps, followed by processing by a loom. Next, warps are moved upward and
5 downward such that the wefts are sandwiched between the warps for weaving, providing a fabric.

[0037]

There has been described a warp sizing agent as an example, but a textile sizing agent of the present invention can be effectively utilized as a sizing
10 agent for resin finishing of a fabric, a sizing agent for laundry, a sizing agent for printing or a binder for a felt or a nonwoven fabric.

EXAMPLES

[0038]

15 There will be detailed the present invention with reference to Examples and Comparative Examples. In Examples and Comparative Examples below, "part(s)" and "%" are, unless otherwise indicated, on mass basis.

[0039]

20 A size pick-up amount is measured by a method for calibrating in terms of fluff loss during desizing and washing as described in "Warp Sizing" (Kaname FUKADA, Teruhiko ICHIMI, published by The Textile Machinery Society of Japan, 4th edition; pages 299 to 302).

[0040]

25 <Evaluation>

[Size peeling]

Sized warps obtained in any of Examples and Comparative Examples were humidity-controlled at 20 °C and 40 %RH (relative humidity), and were weaved to form a 3000 m fabric under the weaving conditions described below, during which the amount of detached sizing agent on the loom (a reed, a heald, a dropper unit and so on) was visually observed and evaluated in accordance with the following criteria. In the evaluation, A and B are an employable level.

A: very little

10 B: little

C: much

[0041]

[Weaving performance]

Sized warps obtained in any of Examples and Comparative Examples were humidity-controlled at 20 °C and 40 %RH (relative humidity), and were weaved for three days under the weaving conditions described below. Weaving performance was evaluated in accordance with the following criteria. Here, weaving performance (weaving efficiency) is a weaving length per a unit weaving time divided by a theoretical weaving length. In the evaluation, A and B are an employable level.

A: 95 % or more

B: 90 % or more and less than 95 %

C: less than 90 %

[0042]

25 [Fabric texture]

Texture of a fabric obtained was evaluated in accordance with the following criteria. In the evaluation, A and B are an employable level.

A: soft and smooth

B: hardish

5 C: hard

[0043]

[Desizing performance]

A fabric obtained by the method below was treated in a 0.1 % aqueous sodium hydroxide solution at 60 °C for 30 min, and rinsed with warm
10 running water at 40 °C for one minute for removing the alkali. After drying, desizing performance was evaluated with the aid of iodine coloration in accordance with the following criteria. In the evaluation, A and B are an employable level.

A: No colored parts are observed.

15 B: Some colored parts are observed.

C: Over the whole surface, colored parts are observed.

[0044]

[Example 1]

A size solution prepared by the formulation described below was
20 used for sizing under the following conditions. Subsequently, a sized yarn prepared was used for weaving under the following conditions.

(1) Size formulation

PVA [PVA-117: Kuraray Co., Ltd.]	70
parts	

25 Modified starch [CM-3800: Nihon Shokuhin Kako Co., Ltd.]	30
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parts

Paraffinic wax [melting point: 75 °C, JNC-204: Kan-ei Industry Corporation] 7 parts

PVA, the modified starch and the paraffinic wax were added in this order such that each component was added in three portions, and the mixture was blended, to a powdery blended sizing agent in which each component was homogeneously dispersed.

(2) Gelatinization conditions

The blended sizing agent described above was added to water in a size solution tank at 20 °C, and the mixture was stirred for 10 min with a revolution of 200 rpm using a 4-pitched-blade paddle impeller (pitch angle: 45 °). Then, water was added to the mixture to prepare a liquid with a solid concentration of 10 % by mass. Here, the solid is substantially undissolved. Then, with stirring, the liquid was heated to 95 °C by introducing steam. Then, the mixture was allowed to be stirred at 95 °C for 1 hour, to give a size solution.

(3) Warp sizing conditions

Sizing machine: 2-box 2-sheet type, from Tsudakoma Corp.

Size solution temperature: 90 °C

Squeeze roll width: 1800 mm

Squeeze load: 800 kg/1800 mm width

Warp speed: 60 yard/min

Drying temperature: 100 to 130 °C

Warp: cotton yarn ("Kingyo" C40/1, from Toyobo Co., Ltd.)

Sized yarn length: 5600 yard

(4) Weaving conditions

Warp: sized yarn obtained in (3)

Weft: cotton yarn ("Kingyo" C40/1, from Toyobo Co., Ltd.)

Warp density: 136/inch

Weft density: 72/inch

5 Weaving width: 47 inch

Total number of warps: 6420

Weave: broad

Loom: air-jet loom ZA-209i, from Tsudakoma Corp.

Revolution of the loom: 600 rpm

10 [0045]

[Average particle size of wax]

Using the size solution (solid concentration: 10 % by mass) at 95 °C prepared under the pasting conditions described in (2), an average particle size (X) of the wax at 70 °C and an average particle size (Y) of the wax at 20 °C were determined. Furthermore, X/Y was calculated in accordance with formula (I). Here, average particle sizes (X) and (Y) of a wax were determined by dynamic light scattering using a laser particle-size analyzing system PAR-III [Otsuka Electronics Co., Ltd.].

[0046]

20 [Examples 2 to 6, Comparative Examples 1 to 4]

As described in Example 1, except that the type of PVA, a ratio of PVA/starch, a wax content and the like were changed as shown in Table 1, a blended sizing agent was produced, a size solution was prepared, sizing was conducted, followed by weaving. For the size solution obtained, average particle sizes (X) and (Y) of the wax were measured as described in Example 1.

Furthermore, for the sized yarn and the fabric obtained, size peeling, weaving performance, fabric texture and desizing performance were evaluated as described in Example 1. The results are shown in Table 1.

[0047]

5 [Example 7]

As described in Example 1 except that in terms of gelatinization conditions, a revolution of the 4-pitched-blade paddle impeller is changed to 150 rpm, a size solution was prepared, sizing was conducted, followed by weaving. For the size solution obtained, average particle sizes (X) and (Y) of the wax
10 were measured as described in Example 1, and X/Y was calculated.

Furthermore, for the sized yarn and the fabric obtained, size peeling, weaving performance, fabric texture and desizing performance were evaluated as described in Example 1. The results are shown in Table 1.

[0048]

15 [Example 8]

As described in Example 1 except that in terms of gelatinization conditions, a revolution of the 4-pitched-blade paddle impeller is changed to 100 rpm, a size solution was prepared, sizing was conducted, followed by weaving. For the size solution obtained, average particle sizes (X) and (Y) of the wax
20 were measured as described in Example 1, and X/Y was calculated.

Furthermore, for the sized yarn and the fabric obtained, size peeling, weaving performance, fabric texture and desizing performance were evaluated as described in Example 1. The results are shown in Table 1.

[0049]

25 [Comparative Example 5]

As described in Example 1 except that in terms of gelatinization conditions, a revolution of the 4-pitched-blade paddle impeller is changed to 80 rpm, a size solution was prepared, sizing was conducted, followed by weaving. For the size solution obtained, average particle sizes (X) and (Y) of the wax were measured as described in Example 1, and X/Y was calculated. Furthermore, for the sized yarn and the fabric obtained, size peeling, weaving performance, fabric texture and desizing performance were evaluated as described in Example 1. The results are shown in Table 1.

[0050]

10 [Comparative Example 6]

A size solution was obtained as described in Example 1 except that, in preparing a blended sizing agent, PVA, the modified starch and the paraffinic wax were added in this order at once, instead of adding each component in three portions. Using the size solution, sizing was conducted, followed by weaving. For the size solution obtained, average particle sizes (X) and (Y) of the wax were measured as described in Example 1, and X/Y was calculated. Furthermore, for the sized yarn and the fabric obtained, size peeling, weaving performance, fabric texture and desizing performance were evaluated as described in Example 1. The results are shown in Table 1.

20 [0051]

[Table 1]

	PVA ^{*1}	PVA/starch (mass ratio)	Wax			Size pick-up (%)	Evaluation results			
			Content (% by mass)	Particle size X(μm)	X/Y		Size peeling	Weaving performance	Fabric texture	Desizing performance
Example 1	PVA-117	70/30	6.5	2.1	0.27	10.6	A	A	A	A
Example 2	PVA-217	70/30	6.5	1.9	0.26	10.5	A	A	A	A
Example 3	PVA-117	50/50	6.5	2.4	0.27	10.5	B	A	B	A
Example 4	PVA-117	85/15	6.5	2.1	0.27	10.8	A	B	A	A
Example 5	PVA-117	70/30	1	2.0	0.25	10.6	A	B	B	A
Example 6	PVA-117	70/30	18	9.0	0.39	10.8	B	A	A	A
Example 7	PVA-117	70/30	6.5	25	0.68	10.6	A	B	A	B
Example 8	PVA-117	70/30	6.5	45	0.85	10.6	A	B	B	B
Comparative Example 1	PVA-117	70/30	0	-	-	10.7	A	C	C	A
Comparative Example 2	PVA-117	70/30	22	12	0.42	10.8	C	A	A	C
Comparative Example 3	PVA-117	100/0	6.5	2.3	0.27	10.6	A	C	B	B
Comparative Example 4	-	0/100	6.5	4.8	0.32	11.2	C	B	C	A
Comparative Example 5	PVA-117	70/30	6.5	70	0.94	10.6	B	B	B	C
Comparative Example 6	PVA-117	70/30	6.5	55	0.90	10.6	A	B	B	C

*1: PVA-117 (from Kuraray Co., Ltd.) ; viscosity-average polymerization degree: 1700; saponification degree: 98.5 mol%

PVA-217 (from Kuraray Co., Ltd.) ; viscosity-average polymerization degree: 1700; saponification degree: 88 mol%

CLAIMS

1. A textile sizing agent comprising polyvinyl alcohol, starch and wax,
wherein

5 the polyvinyl alcohol has a viscosity-average polymerization degree
of 200 to 5000 and a saponification degree of 70 to 99.5 mol%;

 a mass ratio of the polyvinyl alcohol to the starch is 90/10 to 1/99;

 a content of the wax is 0.5 to 20 % by mass based on the total
amount of solid; and

10 in an aqueous dispersion at 70 °C prepared from the textile sizing
agent with a solid concentration of 10 % by mass, an average particle size (X)
of the wax is 0.1 to 50 μm;

wherein the viscosity-average polymerization degree and the saponification
degree are measured in accordance with JIS K6726:1994.

15 2. The textile sizing agent according to Claim 1, wherein for the
aqueous dispersion with a solid concentration of 10 % by mass, an average
particle size (X) of the wax at 70 °C and an average particle size (Y) of the wax
at 20 °C meet the following formula (I).

$$0.05 \leq X/Y \leq 0.8 \quad (I)$$

20 3. The textile sizing agent according to Claim 1 or 2, wherein the wax
comprises a petroleum wax.

 4. The textile sizing agent according to any of Claims 1 to 3, wherein
the starch is modified starch.

 5. A warp sized using the textile sizing agent according to any of
25 Claims 1 to 4.

6. A process for producing a fabric, comprising weaving the warps according to Claim 5 and wefts using a loom.